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Steve Bishop

A Typology for Science and Religion

Mr Bishop, who lectures at Soundwell College, Bristol, has written elsewhere on the relationship of religion to science; in this article he offers us a helpful classification of the various ways in which that relationship has been understood.

Keywords: Science; religion; dialogue; Genesis.

Introduction

Recent years have seen the proliferation of books and articles on the relationship of science and religion. Science, it seems, is making God fashionable once more!¹ The relationship between science and religion is highly complex. The limited purpose of this paper is to mark out some of the terrain of the subject² and at the risk of oversimplifying I have identified several ways in which this relationship can be construed. Though before I do, some words of caution are in order.

It has been said that people can be placed into one of two categories: lumpers and splitters. The approach taken here is that of a lumper. I am aware that in lumping people under different positions I sometimes fail to do justice to the nuances of their positions. Occasionally those who write on science and religion employ a range of models depending upon the audience; nevertheless there is (usually) enough consistency within their overall position to lump them into one category. Splitters such as John Hedley Brooke rightly point out that the relationship between science and religion is more complex than lumpers often make out. And yet there is value in a lumping approach: it provides a framework within which to examine those subtle nuances.

1 Books written by scientists with 'God' in the title include: Leon Lederman *The God Particle* (1993); Robert Matthews *Unravelling the Mind of God: Mysteries at the Frontier of Science* (London: Virgin, 1992); Paul Davies *God and the New Physics* (Harmondsworth: Penguin, 1989) and *The Mind of God* (London: Simon and Schuster, 1992).

2 A bibliography can be found in: Steve Bishop, 'Introductory resources for the interaction of science and Christianity', *Themelios*, 19 (2), 1994, 16-20.

Defining science

However, before I begin lumping, it will be necessary to provide a working definition of what I mean by science and religion. What is science? This question has thwarted and puzzled philosophers of science for decades if not centuries. What is it that makes science science? Contemporary developments in the philosophy of science have shown that there is no such thing as the scientific method. The distinction between science and non-science is not so marked as is often thought.³ It can perhaps be viewed as a spectrum. As Wolterstorff puts it: 'science [is] different only in degree from ordinary life'.⁴ We only have to consider the processes one goes through in crossing the road: hypothesising that it is safe to cross the road based on observations and inferences of car speeds, based on background information and patterns.⁵

For the Christian, science is a God-given activity by which we are to unfold and develop God's good creation.⁶ A biblical perspective on science can be seen through the spectacles of creation, fall and redemption.

Creation. God, through Christ, is the source and sustainer of all things. Therefore, science has its roots in God. The command to humanity as the image-bearers of God is to subdue and rule the creation. This is not to be seen in terms of domination, but rather as a shepherd tends her sheep. It is an injunction to develop and fill the creation, to continue the creative work of God. Science then is part of our calling to care for and open up God's good creation, to develop culture. Adam's naming of the animals can perhaps be seen in this context as one of the first scientific tasks, that of observation and classification.

Fall. Then came sin. No area of life is untainted with sin; it is all-pervasive. This is the case with science. In many cases it has become an idol. Science has become divinized. It makes claims to omniscience: the only way to reliable knowledge is through science. It subsumes every aspect of life: we have the science of beauty therapy, the science of catering, the science of food and cooking, the science of hairdressing, Science has become salvific:⁷ it has become scientism.

3 See e.g. Stephen C. Meyer, 'The methodological equivalence of design and descent' in J. P. Moreland (editor), *The Creation Hypothesis: Scientific Evidence for an Intelligent Designer*, Downers Grove: IVP, 1994.

4 Nicholas Wolterstorff, *Reason within the Bounds of Religion* (2nd edn) (Grand Rapids: Eerdmans), 65.

5 Cf. Robin Millar and Rosalind Driver, 'Beyond processes', *Studies in Science Education*, 1987, 14, 33–62.

6 Steve Bishop, 'Science and faith: boa constrictors and warthogs' *Themelios*, 19, 1993, 4–9.

7 See for example: Mary Midgeley, *Science as Salvation* (London: Routledge, 1992).

The other extreme is that science has become demonized. Lynn White Jr placed the blame for the 'ecologic crisis' on science and Christianity. Many examples illustrate the problems scientific 'advances' bring: Hiroshima, Bhopal, Love Canal, Chernobyl. The fall has distorted the God-given role and function of science.

Redemption. As sin has affected every area of life, so too does redemption. Redemption potentially 'undoes' the fall. Redemption means that science can be restored to its right place. However, science should neither be divinized nor denigrated. A Christian position avoids both extremes. Science has an important, albeit limited, role to play in developing the creation. Redeemed humanity can now transform the scientific enterprise and redirect it so that it can be used wisely and responsibly under God to open up the potentiality within creation.

Defining religion

The relationship of religion to belief and faith is notoriously slippery and many writers on the science-religion axis often use the terms as synonyms. To arrive at a satisfactory definition of all three would require a full size monograph. Given a few hours time J. Milton Yinger said that he could gather a hundred different definitions of religion. However, despite that we can broadly delineate three definitions of religion: civil religion; folk religion; and natural, implicit or invisible religion.

Many scientists are adherents of a form of civil religion, be it Parson Thwakum's type of religion or a more non-conformist form. This is not the type of religion I have in view in this study. The religion in view in this study is the third category: an implicit form of religion. I shall take as my *working definition* that of Christian philosopher Roy Clouser.

A religious belief is any belief in something or other as divine . . . 'Divine' means having the status of not depending on anything else.⁸

Hence a religion is a worldview or ideology that attributes the status or nature of divinity to something or someone; it does not necessarily have a cultic dimension.

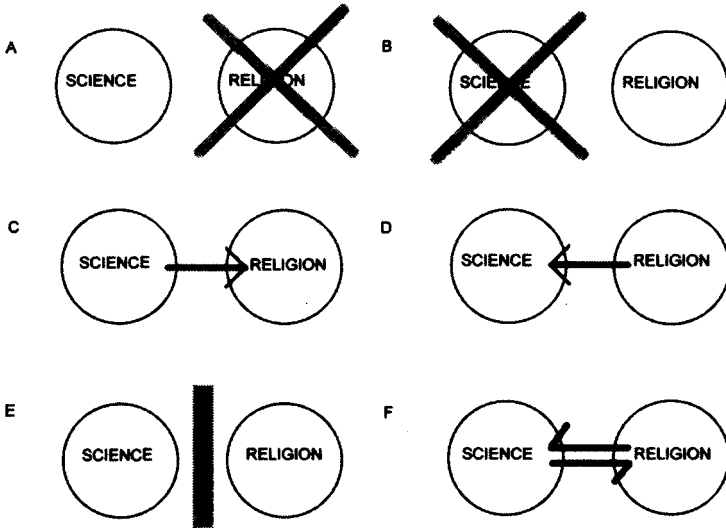
A model for the relationship of science and religion

Historically there have been many ways in which scientists and theologians have construed the relationship between science and religion.

⁸ Roy A. Clouser, *The Myth of Religious Neutrality: An Essay on the Hidden Role of Religious Belief in Theories*, (Notre Dame: University of Notre Dame Press), 21-2. This of course would mean that, by this definition, materialism is a religion.

The most common approach is to describe them as: conflict, independence, harmony and dialogue.⁹

A more fruitful approach, which has the advantage of simplicity, is illustrated graphically below.



A graphical representation of how science and religion can relate.

A: 'science replaces religion'. B: 'religion replaces science'. C: 'science shapes religion'. D: 'religion shapes science'. E: 'science and religion are independent'. F: 'science and religion in dialogue'.

Science replaces religion

This idea that science conflicts with religion and thus makes religion redundant has its historical roots, at least in a popular form, are in the writings of John Draper and subsequently by Andrew Dickson White's (1832–1918) two volumed book *A History of the Warfare of Science with Theology in Christendom* (1897).¹⁰ The words of a former editor of *Nature* epitomise this attitude:

⁹ See, for example, Ian G. Barbour, *Religion in an Age of Science* (Gifford Lectures 1989–1991) vol 1 (London: SCM, 1990), who proposed conflict, independence, dialogue and integration.

¹⁰ A reprint of the 1897 edition is being made available by Thoemmes Press, Bristol.

My grandfather preached the gospel of Christ,
My father preached the gospel of Socialism,
I preach the gospel of Science.

The biologist and historian of science, William Provine puts it like this:

Show me a person who says that science and religion are compatible, and I will show you a person who (1) is an effective atheist, or (2) believes things demonstrably unscientific, or (3) asserts the existence of entities or processes for which no shred of evidence exists.¹¹

The warfare, or conflict approach seems to be supported by history: Galileo v. Church (1616); Huxley v. Wilberforce (1860); Catastrophism v. Uniformatism; Creation v. Evolution, as exemplified in the 'Scope's monkey trial' (1925). However, the main thesis of White's and Draper's work has been shown to be based on 'misinformation and half-baked history'.¹² Lindberg and Numbers in a long overdue appraisal of White's work conclude:

This brief excursion to some of White's old battlefields has demonstrated that the historical relationship between science and Christianity—or, more properly, scientists and theologians—cannot be reduced simply to conflict or warfare.¹³

The resilience of this conflict metaphor is seen in an issue of the Institute of Physics' journal *Physics Education*. Edgar Pearlstein, Professor of Physics at the University of Nebraska, in response to an editorial that sought to expose the myth of the conflict thesis,¹⁴ ironically accused the editor of repeating 'the comfortable myth that there is no essential conflict between science and religion'¹⁵ and cited White's work in support of his argument!¹⁶

The prevalence of this myth provides an excellent illustration of how worldviews colour one's perceptions of reality. The combatants in the conflicts that did exist were not science and Christianity. Much of

11 William Provine, 'Scientists, face it! Science and religion are incompatible', *The Scientist* 5 September, 1988, 10.

12 David N. Livingstone, *Darwin's Forgotten Defenders*, (Grand Rapids: Eerdmans/ Edinburgh: Scottish Academic Press, 1987), 1.

13 David C. Lindberg and Ronald L. Numbers, 'Beyond war and peace: a reappraisal of an encounter between Christianity and science', *Church History* 55, 1986, 352.

14 Brian E. Woolnough, 'Conflict?—What conflict?' *Physics Education*, 25, 1990, 69.

15 Edgar Pearlstein, 'Science and religion: conflicting or complimentary?', *Physics Education*, 1990, 25, 239.

16 Many others have accepted uncritically the Draper-White thesis, this is evidenced in the oft-repeated myth that Calvin opposed the Copernican heliocentric view. This view erroneously attributed to Calvin had its origins in White's *A History of Warfare*. See R. Hooykaas, *Religion and the Rise of Modern Science* (Edinburgh: Scottish Academic Press, 1972), 121.

the conflict was between the 'new science' and the 'sanctified science of the previous generation'.¹⁷ Draper's and White's views have no basis in history.¹⁸

Contemporary advocates of this view include Carl Sagan, Richard Dawkins and Peter Atkins.¹⁹ Again, this perspective is more a product of their worldview than any historical or scientific data.

An Oxford theology don has described Dawkins as the 'most evangelical atheist I've ever met'²⁰ In a letter to the *Independent*,²¹ following Susan Howatch's endowment of the Starbridge lectureship to study science and religion, Dawkins asserts:

What has 'theology' ever said that is of the smallest use to anybody? When has theology ever said anything that is demonstrably true and is not obvious? . . . The achievements of theologians don't do anything, don't achieve anything, don't even mean anything. What makes you think that 'theology' is a subject at all?

Dawkins' sees religion (s) and God as 'competing explanations for facts about the universe and life'.²² Science, for Dawkins becomes the basis by which to judge all things:

Either admit that God is a scientific hypothesis and let him submit to the same judgement as any other scientific hypothesis. Or admit that his status is no higher than that of fairies and river sprites.²³

Here Dawkins exposes his scientism: science can explain anything and is the only legitimate way of knowing. Science is the legitimising principle for all knowledge, he gets dangerously close to divinising science and thus making science into a religion. For Dawkins religion is the result of a 'pattern of heredity'. However, the argument is two-edged: Dawkin's allegiance to atheism could also be a matter of heredity!²⁴

17 John Hedley Brooke, *Science and Religion: Some Historical Perspectives* (Cambridge: Cambridge University Press, 1991), 37.

18 Colin A. Russell, 'The conflict metaphor and its social origin', *Science and Christian Belief*, 1989, 1 (1), 3-26.

19 See for example Carl Sagan, *Cosmos: The Story of Cosmic Evolution, Science and Civilisation*, (London: Futura [orig 1981]); Richard Dawkins, *The Blind Watchmaker*, (Harlow: Longman, 1986); Peter Atkins, *The Creation*, (Oxford: W. H. Freeman, 1981).

20 Cited in *Independent on Sunday*, 2 Jan 1994, 17.

21 20 March, 1993

22 Richard Dawkins, 'A reply to Michael Poole', *Science and Christian Belief*, 1995, 7 (1), 46.

23 Dawkins (1995), 47.

24 Michael W. Poole, 'A critique of aspects of the philosophy and theology of Richard Dawkins' *Science and Christian Belief*, 1994, 6 (1), 41-59. See also Keith Ward, *God, Chance and Necessity* (Oxford: Oneworld, 1996).

Religion replaces science

An equal but opposite error to the above is the 'religion replaces science' position. This is the position of the extreme creationists.²⁵ Creationists reject any scientific theories or observations that appear to conflict with a literal six-day creation interpretation of Genesis.²⁶ They reject such science as naturalistic, self-contained, non-purposive, directional, irreversible, universal and continuing. This contrasts with creation science which is: supernaturalistic, externally directed, purposive and completed.²⁷

Evolutionary science is thus replaced by creation science. This creation science often presupposes a narrow one-dimensional (mis)reading of Genesis 1. Hence, it is religious presuppositions that shape the creation science that replaces traditional science.

Science and religion are independent

A recent book, *Cosmos, Bios, Theos*,²⁸ contains the responses of sixty leading scientists to six questions about how science and religion interact. One of the questions was 'What do you think should be the relationship between religion and science?'. The scientists interviewed were 'known to be theistic or at least sympathetic to a religious view of reality'. It is significant that the majority accepted that science and faith were distinct independent non-interacting realms. It is this view that has enabled the 'ueasy truce' between science and religion to hold.

Within the independence position we can classify two main approaches: strong and weak independence.

Strong independence

This approach sees science and religion as two very distinct categories. The barrier between the two realms is non-permeable.

25 Robert Snow in Howard J. Van Till (ed.), *Portraits of Creation: Biblical Perspectives on the World's Formation* (Grand Rapids: Eerdmans, 1990), discerns two types of creationists: the extreme such as John N. Moore, Henry Morris and Thomas Barnes and the more moderate such as Paul Steidl, Wayne Friar and Percival Davis. We could also add James P. Moreland and the other contributors to *The Creation Hypothesis* (Moreland, ed., 1994) to the list of more moderate creationists. .

26 On the range of ways of interpreting Genesis 1 and science see the Appendix.

27 Henry M. Morris (ed.), *Scientific Creationism (General Edition)*, (El Cajon, CA: Master Books, 1974), 11.

28 Henry Margenau and Roy Abraham Varghese (eds), *Cosmos, Bios, Theos: Scientists Reflect on Science, God, and the Origins of the Universe, Life, and Homo sapiens* (La Salle, Ill: Open Court, 1992).

A resolution from the US National Academy of the Sciences, made in the aftermath of the Californian 'equal time' debate (October 1972), exemplifies this position:

... religion and science are ... separate and mutually exclusive realms of human thought whose presentation in the same context leads to misunderstanding of both scientific theory and religious belief.²⁹

The Catholic physicist and historian of science Pierre Duhem (1861–1916) is an advocate of this category. When his approach was described as being 'that of a believer' he responded:

I have constantly aimed to prove that physics proceeds by an autonomous method *absolutely independent of any metaphysical opinion*.³⁰

He rejects the possibility of any conflict between science and metaphysics, faith, because they have no common term. Religion is based on 'judgments touching on objective reality', whereas science 'is neither true nor false; it merely gives a more or less satisfactory picture of the laws it intends to represent'.³¹ Here Duhem advocates an instrumentalist view of science; although he does not deny that there is a reality independent of the knower. His instrumentalism is an attempt to 'save the phenomenon'; it was a ploy offered to Galileo to save him coming into conflict with the Pope. Duhem is mistaken in separating metaphysics/ religion and science. There are metaphysical/ religious presuppositions in all scientific activity. These will be discussed subsequently. Suffice to mention at this point that metaphysical presuppositions include: belief in an orderly universe, whose order is both knowable and contingent, i.e. it has to be discovered by investigation and experimentation rather than deduced; and that investigation is desirable, possible and profitable.

Other advocates of this position are: G. D. Yarnold,³² David L. Dye³³ and Russell Hindmarsh.³⁴ David Dye sees science as describing the physical universe, and faith dealing with:

A different kind of reality, which we call 'spiritual reality', not amenable to direct controlled observation nor scientific description.

29 Cited in William H. Austin, *The Relevance of Natural Science to Theology* (London: MacMillan Press, 1976), 1.

30 Pierre Duhem, *The Aim and Structure of Physical Theory*, (New York: Atheneum, 1962; orig. 1905), 274, my emphasis.

31 Duhem (1962), 285.

32 G. D. Yarnold, *Christianity and Physical Science* (London: Mowbray, 1950).

33 David L. Dye, *Faith and the Physical World: A Comprehensive View* (Exeter: Paternoster Press, 1966).

34 W.R. Hindmarsh (1970) 'Faith of a physicist' *Expository Times* 82 (December), 68–70; and 'Science and Christianity' *Expository Times* 85 (March), 180–3.

Science deals with observations and explanations while faith or religion deals with ultimate goals or understandings. At a popular level it is presented in terms of science asks 'How?', religion 'Why?'. The problem is that reality is not so simple. Explanations of this sort, while perhaps suitable for Sunday School, do not bear much close scrutiny. It presupposes that religion cannot ask 'How?' questions and science 'Why?' questions. A comparison of the questions about time posed by, say, Moltmann and physicist Stephen Hawking, soon lay that fallacy to rest.

The late Russell Hindmarsh, a nuclear physicist and Vice-president in the Methodist Church, makes a sharp distinction between objective and subjective knowledge:

We are contending here that there are at least two modes of knowing. One is the scientific, objective mode; the other is the mode of faith, not objective in the scientific conclusions concerning the structure and dynamics of the natural world; the other grasps the truth of God.³⁵

However, recent philosophy and sociology of science has exposed the myth of objectivity in science. The objectivity of science is a positivist fallacy. Facts are not neutral, they are theory-laden. Brute facts are mythological beasts that have more in common with unicorns than reality.

As Polanyi has made clear, science is based on personal commitments.³⁶ Science is a human activity, and as with any human activity it is value-laden. It is laden with the cultural, political, economic . . . values of the scientist.

Weak independence: complementarity

Within evangelical circles the dominant paradigm is termed complementarity. A recent questionnaire of Christian Biology teachers at Christian academic institutions in the States has identified it as the most common model used for relating science and scripture.³⁷

Complementarity to some degree holds that 'science and religion are independent', but allows for some interaction. Hence the barrier is semi-permeable.

Complementarity The term complementary to describe the relationship between science and religion is usually associated with Donald MacKay (1922–1987). MacKay has been described by R. J. Berry as one

35 Hindmarsh (1974), 181–2.

36 Michael Polanyi, *Personal Knowledge: Towards a Post-Critical Philosophy* (London: Routledge and Kegan Paul, 1958).

37 60.3 per cent; 44 out of 73 returned questionnaires. John E. Lothers, Jr., 'Biology teachers' views on evolution, possible distinction of theistic views' *Perspectives on Science and Faith*, 1995, 47 (3), 177–85.

'who has probably contributed more than anyone this century to the Christian understanding of science'.³⁸ One of the first uses of the term complementarity in this context was in a symposium on 'Mentality in machines', sponsored by the Mind Association and the Aristotelian Society (1952).³⁹

MacKay later offered a more nuanced description of complementarity:

I call two or more statements complementary when (a) they purport to have a common reference, (b) they make different allegations, yet (c) all are justifiable in the sense that each expresses something about the common references which could not (for one reason or another) be expressed in the terms of the others—the commonest reason being . . . that the terms belong to different logical categories.⁴⁰

Though the most common position held by evangelicals,⁴¹ it is not a uniquely evangelical or even Christian position. Brian Josephson⁴², Plutarch (c. AD 45–120), a Baha'i, Khursheed,⁴³ also belong to this category. An empirical study by Helmut Reich⁴⁴ identified complementarity as the main approach to the interplay between science and faith by adolescents.

The complementarity position is often described as being analogous to different views of the same mountain, an architect's plan and elevation drawing, binocular vision, the wave-particle duality of electrons and light, and the hardware and software on computers. In the same way as electrons and light can be described by both waves and particles, so too can reality be explained by both religion and science without contradiction. Science and religion cannot be reduced to each other. They offer different, supplementary levels of explanation, which are true provided they are not contradictory, so the complementaristists argue

38 *Church of England Newspaper*, 19 May 1995, 10

39 D. M. MacKay, 'Mentality in machines', *Aristotelian Society Supplement.*, 1952, **XXVI**, 61–86.

40 D. M. MacKay, 'Complementary descriptions', *Mind*, 1957, **66**, 390

41 For example: R. J. Berry, R. L. F. Boyd, Richard Bube, Roger Forster and Paul Marston, J. N.(Tim) Hawthorne, Rodney D. Holder, John Houghton, Malcolm Jeeves, Douglas Spanner, Howard Van Till, David Wilkinson and John Wright.

Mike Poole rejects the term 'complementarity', prefers the term 'compatible'; though this seems merely a different name for a similar position.

42 Brian Josephson, 'Physics and spirituality: the next grand unification?', *Physics Education*, 1987, **22**, 15–19.

43 Anjam Khursheed, *Science and Religion: Towards the Restoration of an Ancient Harmony* (London: One World, 1987). Khursheed's work is characterized by a poor grasp of the philosophy of science; he advocates inductivism as the scientific method, 42–3.

44 Helmut Reich, 'Between religion and science : complementarity in the religious thinking of young people', *British Journal of Religious Education*, 1988–89, **11**, 62–9.

Complementarity despite its popularity is not without its problems. Polkinghorne notes that it is not an instantly explanatory concept.⁴⁵ Ian Barbour is unsympathetic towards complementarity.⁴⁶ He is dubious about extending the use of the term to explain science and religion. He is so for several reasons.⁴⁷ It provides 'no justification for an uncritical acceptance of dichotomies'; it cannot be evoked to deal with inconsistencies. Models should be called complementary only if they 'refer to the same entity and are of the same logical type'; such as describing God as a Father and a Shepherd; or electrons as waves and particles, but not to two differing entities such as science and religion.⁴⁸

Describing two apparently contradictory events as complementary does not help in ascertaining the truth or validity of either of those events. In such a case complementarity is unhelpful. Can two incompatible events be described as complementary? For example, the Big Bang theory of origins and Genesis 1 may be viewed as complementary; but they could also be contradictory. Complementarity does not help in determining whether they are contradictory or not.

Complementarity also serves to divorce science from religion. This charge is denied by Bube. He notes (citing James Moreland⁴⁹) that 'complementarity is compartmentalism' is a very common misinterpretation.⁵⁰ And yet, the interaction that Bube insists that there is is very minimal: 'Complementarity recognizes that valid insights from science and theology both deal with the same reality and must be integrated',⁵¹ writes Bube, and yet he gives no indication of how it might be achieved in practice. This is why complementarity is placed within a soft independence position in my categorisation. Complementarists tend to deny independence in theory but acts as if religion and science were largely independent in practice. Professing complementarists, but practising independentists? One means of support for a complementarist position, proposed by Van Till,⁵² is to say that there is

45 John Polkinghorne, *Reason and Reality: The Relationship between Science and Theology* (London: SPCK, 1991), 27. It is thus surprising that Richard H. Bube, *Putting it all Together: Seven Patterns for Relating Science and the Christian Faith* (Lanham: University Press of America, 1995), 177 cites Polkinghorne as being 'sympathetic to the concept of complementarity'.

46 Barbour (1990).

47 Barbour (1990), 100.

48 Compare P. Alexander, 'Complementary descriptions', *Mind* 65, 145–65.

49 J. , Moreland 'Is natural science committed to methodological naturalism?' in *Science and Creation* (Hillsdale, MI: Hillsdale College, 1993). I have not seen this reference in order to check Moreland's comments.

50 Bube (1995), 168.

51 Bube (1995), 169.

52 Howard J. Van Till, 'Basil, Augustine and the doctrine of creation's functional integrity' *Science and Christian Belief*, 1996, 8 (1), 21–38

a 'functional integrity' within creation. Van Till draws upon Augustine and Basil and yet he is guilty of eisegesis in that he reads them in the light of his complementarist perspective—and of a very selective reading of Augustine, in particular.⁵³

Adherents of complementarity tend to use the Baconian metaphor of the two books: the book of scripture and the book of nature.⁵⁴ This metaphor was probably first used by Francis Bacon in his *The Advancement of Learning and the New Atlantis* (1605; sections 1.1.3, 1.6,16) It was adopted by

. . . those who inclined towards developing the idea of neutrality, or separateness, or autonomy, of science took a position that became epitomized in the metaphor of the two books, the Book of Scripture and the Book of Nature, both created by God as manifestations of His omnipotence and omniscience, but books different in character that had to be kept apart.⁵⁵ [/ex]

Complementarity largely accepts that science is neutral in regard to religious belief. This is certainly the position of MacKay in practice if not in theory:

The discipline of science is autonomous in the sense that we need not have any explicit theological convictions in order to practise it. It has developed and been moulded under pressure of the data themselves—data to whose implications Christian and non-Christian alike find they must be obedient if their scientific enterprise is to succeed.⁵⁶

If the scientist is also a Christian, there is no implication that he should necessarily do better in science, still less that his scientific findings should differ from those of his non-Christian colleagues.⁵⁷

Here is a denial that Christianity has anything to do with science, and an endorsement of methodological naturalism. For MacKay science is divorced from any religious or cultural presuppositions; this is dangerously close to a positivist view of science: a science that must bow down to bare value-free facts. Science, for MacKay, is neutral with respect to religion and faith commitments.

The scientist's reasons for keeping his private emotions [and presumably religious commitments] out of the official picture is that, despite his enthu-

53 For a more balanced reading of Augustine see Louis Lavalley, 'Augustine on the creation days' *JETS*, 1989, 34 (4), 457–464.

54 See, for example, MacKay 'Science and the Bible' in *The Open Mind and other Essays* (Leicester: IVP, 1988), 150–4.

55 Frank E. Manuel, *The Religion of Isaac Newton* (Oxford: Oxford University Press, 1974) 27–8.

56 D. M. MacKay, *The Clockwork Image: A Christian Perspective on Science* (Leicester: IVP, 1974), 88–9.

57 MacKay (1974), 65.

siasm for the subject, he would like to be able to describe the world *as it is*—as it would be *without* him.⁵⁸

He also writes of ‘the neutral character of scientific chance’⁵⁹ and of a ‘theologically neutral, scientific notion’.⁶⁰ It appears that faith is the ‘icing on the cake’; an additional extra, rather than an important essential to science:

As a scientist, I have the job of helping to build scientific language—at the scientific level—as a complete a description of the pattern of physical events as I can, regarding no accessible events as exempt from examination. As a Christian, I find that the very same pattern of events can bear an *additional* and vital significance as part of the activity of God himself.⁶¹

This position is, I believe, unsound, no matter how attractive the complementary position is. We do well to recall the advice given to Archbishop William Temple by his tutor: a phrase is not a solution. It implies that religion has nothing to do with science: Do Christian commitments count for nothing when one does science? Complementarity enables MacKay to adopt a mechanistic approach to his science:

... my own research department at Keele is concerned with the mechanisms of the brain, and that our working hypothesis is that the brain is capable of being studied as a mechanistic system.⁶²

Viewing humans as mechanisms may be complementary to a Christian perspective, but is it a biblical option? Are complementarists content to leave their religious beliefs at the laboratory door? Complementarists thus endorse methodological naturalism.⁶³

To be fair to MacKay he recognizes that complementarity ‘is not a universal panacea . . . A good deal of consecrated hard work is needed on the part of Christians to develop a more coherent and more biblical picture between the two’.⁶⁴

At worst complementarity is a convenient label under which one can avoid compromising religious beliefs by accepting the secularisation of science. The term complementarity is best left to describe wave-particle duality or even mind-matter and free will-determinism,

58 MacKay (1974), 34.

59 MacKay (1974), 53).

60 MacKay (1974), 49.

61 MacKay (1974) 38.

62 MacKay (1974), 12.

63 See, for example Alvin Plantinga, ‘Science: Augustinian or Duhemian?’, *Faith and Philosophy*, 1996, 13(3) 368–394; Phillip J. Johnson, *Reason in the Balance* (Downers Grove: IVP1995) Moreland (ed.) (1994); and the conference organized by Robert C. Koons, on Naturalism, Theism, and the Scientific Enterprise (University of Texas at Austin (Feb 1997))

64 D. M. MacKay (1953b) response to R. E. D. Clark ‘An analogy and its limitations’ *Christian Graduate* 6 (4) (December) 161–67.

but not science and religion. Religious beliefs are much more integral to science than complementarity suggests.

The problem for the adherents of the weak independence position is how should science modify religious beliefs and how should religious beliefs modify science? The solution is non-trivial. Which science should be taken into account? It can open the door to accusations of subjectivism.

The problem with the independence approach is that it largely accepts that science is neutral with regard to religious beliefs. Recent philosophers of science have all but reached a consensus on this point: the epistemological objectivity of science is a myth.⁶⁵

Science is a human cultural activity. Consequently, it is tainted, as is all human activity, with the cultural-religious presuppositions of the scientist (i.e. her worldview). Hanson has shown that observation, a foundation of science, is theory-dependent.⁶⁶ Theories are also worldview-dependent. Scientist cannot escape their culture; science is not done in a vacuum. We cannot divorce science from worldview. Worldviews in turn are inherently religious; they are based on ultimate commitments which cannot be empirically or even rationally verified (or for that matter falsified); they are religious. Science and religious beliefs are then intimately related. We can summarize this argument thus:⁶⁷

1. We all have a worldview
2. A worldview is shaped by religious commitments
3. All human activity is shaped by worldviews
4. Science is a human activity

Therefore,

5. Science and religious commitments are related; and
6. Science is not neutral

This conclusion, if valid, undermines the independence approach to science and religion. It is to another approach, that of science shaping religion, that we now turn.

Science shapes religion

Here science provides a philosophical foundation for religion. A good example of this is process theology, which has developed out of the

65 See my summary of contemporary philosophy of science, and the references therein (Bishop, 1993).

66 N. R. Hanson, *Patterns of Discovery: An Inquiry into the Conceptual Foundations of Science* (Cambridge: Cambridge University Press, 1958).

67 Bishop (1993).

insights of A. N. Whitehead (1861–1947). Whitehead's ideas exemplified in his *Process and Reality*⁶⁸ were developed into a theological scheme by Charles Hartshorne and became known as process theology. Ian Barbour's writings are influenced by process theology.⁶⁹

The emphasis in Whitehead and the process theologians is on change and constant process. Whitehead goes as far as attributing a low level of sentience ('prehensions') to inanimate objects such as rocks. The distinction between God, humans and the rest of creation is thus blurred.

A typical exponent of this approach is the biologist Charles Birch.⁷⁰ Another example of this approach is the work of Father Thomas Berry.⁷¹ Berry draws upon recent cosmology and Teilhard de Chardin to develop a new creation story. One of the problems with this approach is that it can mean that Christian phraseology is baptized into science, and as a result becomes devoid of any Christian content.

A contemporary proponent of the view that 'science shapes religion' is Paul Davies. Davies has written two books that deal with science and religion and over 100 research papers, dealing with gravitation, black holes, cosmology and other areas of theoretical physics, as well as over 20 semi-popular science books. The latter *Mind of God* (MoG) is more nuanced than the former *God and the New Physics* (GNP).

Davies rejects the view that God is a 'cosmic magician' who performs 'supernatural conjuring tricks'.⁷² Science shapes religion and ultimately transcends it, 'In many cases the old religious ideas are not so much disproved as transcended by modern science' (GNP, 3), religion has become 'largely irrelevant'. For Davies human reason reflects the rationality of the world.⁷³ The laws of physics and the success of science also provide evidence of nature's rationality.⁷⁴ The world, for Davies, would be meaningless if these laws existed without reason.

Davies thus attributes divine attributes to these laws of nature: they are universal, absolute, eternal, omnipotent.⁷⁵ They are responsible for the universe originating from nothing and also permit it to self-organize. He also goes on to state that: 'these laws must also have an independent existence'. He however describes the laws as

68 Whitehead (1929).

69 Barbour (1990).

70 Charles Birch, William Eakin and Jay B. McDaniel (editors) (1990) *Liberating Life: Contemporary Approaches to Ecological Theology* (Maryknoll: Orbis).

71 Thomas Berry, *The Dream of the Earth* (Sierra Book Club, 1990); 'The spirituality of the Earth' in Birch et al (1990).

72 Paul Davies, 'Getting to grips with God: science and the superbeing', *The Guardian* 2 (4 May, 1995), 10.

73 MoG, 24.

74 MoG, 24, 191.

75 MoG, 82–3.

'God-given'.⁷⁶ This means they are 'fundamental, eternal, and absolute'.⁷⁷ Elsewhere he summarizes the 'remarkable nature of the laws of physics', they:

- (1) Permit the Universe to come into being from nothing;
- (2) Encourage it to self-organize;
- (3) Fix its evolution in outline (e.g. from simple to complex) but not in detail;
- (4) Bestow upon the Universe the appearance of design.⁷⁸

These laws are however reliant in some sense upon mathematics. His view is that mathematics points beyond itself to a world of platonic forms.

Rationality compels him to see God as 'the ultimate explanation of the world'.⁷⁹ He is 'loth to use' the word God but:

When I do, it is in the sense of the rational ground that underpins physical reality. Used in this way, God is not a person, but a timeless abstract principle that implies something like meaning or purpose behind physical existence.⁸⁰

For Davies it is a god who is a 'directing, controlling, universal mind pervading the cosmos and operating the laws of nature to achieve some specific purpose'.⁸¹

In many ways Davies is a typical rationalist. He has tried to trace scientific rationality to its logical conclusions.⁸² Davies looks to reason and rationality to explain the universe and provide us with a rational, natural God.⁸³ Science as the ultimate expression of rationality should thus be able to provide 'a surer path than religion in the search for God'.⁸⁴ He closes MoG by saying 'We are truly meant to be here'.⁸⁵ And yet he can offer no convincing explanation for this other than the inherent rationality of the universe. Elsewhere he concludes:

I have no idea what the universe is about, but that it is about something I have no doubt.⁸⁶

76 MoG ,87.

77 MoG, 87.

78 'The mind of God' in J. Hilgevoord (ed.), *Physics and our View of the World* (Cambridge: Cambridge University Press, 1994) ch. 11

79 MoG, 178.

80 Davies (1995), 10.

81 GNP, 210.

82 MoG, 223

83 GNP, 223.

84 GNP, ix, 229.

85 MoG, 232.

86 Davies (1995), 10.

Science, it seems, is unable to provide any ultimately satisfying answers! This is hardly surprising given the existence of a non-natural, transcendent God who, as Creator, is other than his creation. For Davies part of creation—the laws of physics—become as God. The Creator and creation are thus conflated.

Christianity is not tied to any one scientific theory. Theories are fallible and religiously controlled. If Christianity, to paraphrase Dean Inge, is wed to a current scientific theory then it is doomed to widowhood in the next generation. This should not be taken to imply that science and religion are independent, or that science is religiously neutral.

Davies accepts controversial scientific theories from which he draws theological conclusions.⁸⁷ But Davies' choice of theory could be seen to come from a commitment that is at heart 'religious'.

Davies' position that science shapes, and ultimately provides a better way than, religion is untenable. His attribution of divine attributes to the laws of physics is a religious faith commitment. Science cannot transcend or replace religion because it is based for Davies on this religious commitment. Likewise, the philosophy of maths that he espouses is shaped by religious commitments.⁸⁸ Platonism contends that there is a realm of eternal, invisible mathematical entities upon which the world depends. The attribution of divine attributes to these mathematical entities, i.e. that they are self-existent, demonstrates the religious nature of this position.

Religious beliefs are thus integral to the scientific enterprise. Science, far from disproving or alleviating the need for religion, reveals that religious beliefs control the scientific enterprise. This is further evidenced in the fact that Christianity provided the historical matrix for the birth of the scientific enterprise.⁸⁹

The examinations of proponents of 'science destroys religion' (A), 'science and religion are independent' (E) and 'science shapes religion' (C) have show that each are untenable. Each to an extent rests on religious beliefs; hence each could be said to be unstable positions that break down to 'religion shapes science' (D). We will now turn to a closer examination of the dialogue position of science and religion (F).

87 Davies in an attempt to show how the universe can create itself *ex nihilo* uses the quantum 'orthodoxy' of Bohr's Copenhagen interpretation. This theory is not without its detractors, not least being Albert Einstein.

88 Steve Bishop, 'Beliefs shape mathematics', *Spectrum*, 1996, 28(2), 131–141.

89 To be fair Davies does acknowledge this: 'The scientific world-view is clearly a product of the Western theological world-view, although scientists today rarely appreciate the theological origins of their assumptions' (in Hilgevoord (ed. 1994), 288.

Science and religion in dialogue

This is perhaps the most common contemporary approach among the 'scientists as theologians', although not all who adhere to this position have common theological viewpoints. Included in this position are classical theists—including Calvinists and Arminians—panentheists, process theologians and the so-called New Agers.

Within this category lies Fritjof Capra.⁹⁰ Capra draws parallels between physics and Eastern mysticism and claims that 'modern science . . . leads us to a world view which is very much in agreement with the ancient Eastern traditions'.⁹¹ However, Capra makes selective use of disputable scientific ideas and parallels them with equally selective Eastern views.⁹²

Christian advocates include Arthur Peacocke, John Polkinghorne, Robert John Russell and Chris Wiltsher.⁹³ Peacocke believes we should reinterpret the images and metaphors of the Christian faith in the light of science. The ones he singles out include God and human nature.⁹⁴ Chris Wiltsher attempts a similar exercise for 'everyday life'. His approach attempts to bring together 'Christian beliefs and the knowledge derived from science about the cosmos in which we live'.⁹⁵ He sees science and theology are 'mutually instructive'.⁹⁶

Russell, commenting on Hawking's quantum cosmology, sees that it has implications for the theological enterprise:

... Hawking's work, even if it does not last within science *per se*, can be enormously helpful to Christian theology by helping us to recognize an assumption we needn't make about creation. It is precisely this sort of interaction between theologians and scientists which signals the promise of a new, highly creative relationship between theology and science.⁹⁷

90 Fritjof Capra, *The Tao of Physics* (London: Fontana, 1976); *The Turning Point* (London: Flamingo, 1982); and Fritjof Capra and David Steindl-Rast with Thomas Matus, *Belonging to the Universe: New Thinking About God and Nature* (Harmondsworth: Penguin, 1992)

91 Capra in T. D. Singh (ed.), *Synthesis of Science and Religion: Critical Essays and Dialogues* (San Francisco: The Bhaktivedanta Institute, 1987), 274.

92 For example his use of Chew's, now discredited, bootstrap theory in Capra (1976).

93 See e.g. A. R. Peacocke, *Theology for a Scientific Age—Being and Becoming—Natural and Divine*, 2nd enlarged edn (London: SCM, 1993); Polkinghorne (1991); Chris Wiltsher, 'Science and theology from an Arminian perspective' in I. H. Jones and K. B. Wilson (ed.) *Freedom and Grace* (London: Epworth, 1988); and Robert John Russell 'Finite creation without a beginning: the spiritual significance of Stephen Hawking's quantum cosmology' *Progress in Theology*, 1993, 1 (3).

94 A.R. Peacocke, 'The challenge of science to theology and the church' in John M. Magnum (ed.), *The New Science—Faith Debate: Probing Cosmology, technology and Theology* (Geneva: WCC/ Fortress, 1989), ch. 2.

95 Wiltsher (1988)

96 Wiltsher (1988), 17

97 Russell (1993), 7

Here the implication is that theology must change in the light of science, but not necessarily vice versa. The science and religion in dialogue position soon breaks down into a science shapes religion position.

If the problem for the weak independence position is the question how should science modify religious beliefs?, this is compounded for the science and religion in dialogue adherents. They also have to face the question how does religion modify science? the reality is that this question is seldom addressed. It is all too often one-way traffic; a monologue rather than dialogue.

Polkinghorne uses many symbols and metaphors to describe the relationship between science and theology: fraternal relationship, complementary, consonance, comradeship, fruitful interaction, kinship, intellectual cousins under the skin and friendship are among them. For Polkinghorne theology provides the answers to meta-questions that arise from science; whereas science tells theology what the world is like.⁹⁸ However, Polkinghorne acknowledges that this dialogue between science and religion is not symmetrical. Science it seems has much more to say to theology than theology does to science. The dialogue almost becomes a monologue.

Polkinghorne's commitment to rationality leads him to see a rational God. This rational God, the source of all creation, has given to his creation the gifts of openness and flexibility within the creation which makes it (almost?) autonomous of God. God is not to be perceived as a deistic God, however, as he interacts—but does not intervene—with creation. This interaction is possible because of the openness of creation. Natural theology is thus possible because God is rational and we can get a glimpse of that rationality within his creation using rational means.

Polkinghorne never justifies his commitment to rationality, it is taken to be self-evident: a faith commitment. Hence, for Polkinghorne it is this religious commitment that shapes his science which in turn shapes his view of reality and theology. Polkinghorne's position is thus a 'religion shapes science' relationship.

Conclusion: religion shapes science

Our brief, broad overview has shown that none of the previous categories are consistent. They all eventually collapse to a 'religion shapes science' position. This is inevitable as religious convictions are basic to humanity, we cannot transcend them. Roy Clouser in his *Myth of Religious Neutrality* has shown that all theories rest on one or other

98 Polkinghorne (1991), 75.

conviction that is religious, in that all theories attribute the status of divinity to one entity or another. This is also true in science—whether it be matter (Dawkins, Atkins), laws of physics (Davies) or rationality (Polkinghorne). Ultimate (religious) beliefs are integral to science and maths, and so religious beliefs shape science. This can be the only conclusion if the argument (1)-(6) on page 46 is valid.

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APPENDIX: GENESIS AND SCIENCE

There are a number of ways that Christians have used to reconcile science and the Bible. (i) *Extreme creationists* reject the scientific evidence and hold onto a literal six-day creation, e.g Morris (1974); (ii) *Progressive creationists* adopt some sort of age day or revelatory day view of Genesis 1 and thus accept an old earth but reject a common ancestor; (iii) *theistic evolutionists* would accept that while God created matter and natural laws, life evolved.

The nineteenth and early twentieth century saw a number of ways of relating the early chapters of Genesis with science.

POSITION	ADVOCATES	WORK	DATE
Flood geology/ creation science	E.G. White	<i>Spiritual Gifts</i>	1864
	George McReady Price	<i>The New Geology</i>	1923
	Byron Nelson	<i>The Deluge Story in Stone</i>	1931
	A.M. Rehwinkel	<i>The Flood in the Light of the Bible</i>	1951
	H. W. Clark	<i>The New Diluvianism</i>	1946
	Henry M. Morris & John C. Whitcomb	<i>The Genesis Flood</i>	1961
Local creation	John Pye Smith	<i>On the Relation Between the Holy Scriptures and certain parts of Geological Science</i>	1840
Ideal time view	Philip Henry Gosse	<i>Omphalos</i>	1857
Gap theory	Buckland	<i>Bridgewater Treatises VI</i>	1837
	Sedgwick	<i>Discourses on the Studies of the University of Cambridge</i>	
	John H. Pratt	<i>Scripture and Science not at Variance</i>	1872
	J.H. Kurtz	<i>Bible and Astronomy</i>	1857
	G.H. Pember	<i>Earth's Earliest Ages</i>	1876
	C.I. Scofield	<i>Scofield Bible</i>	1909
	Harry Rimmer	<i>Modern Science and the Genesis Record</i>	1937
Age-day	James Dana	<i>Manual of Geology</i>	1863
	J.W. Dawson	<i>Origin of the World According to Revelation and Science</i>	1877
	Edwin K. Gedeney	<i>in Modern Science & Christian Faith</i>	1948

POSITION	ADVOCATES	WORK	DATE
Pictorial day	J.H. Kurtz	<i>Bible and Astronomy</i>	1857
	Hugh Miller	<i>Testimony of the Rocks</i>	1849
	A. H. Strong	<i>Systematic Theology</i>	1907
	Canon Dorlodot	<i>Darwinism & Catholic Thought</i>	1923
	L. F. Gruber	<i>The Six Creative days</i>	
	J. Pohle	<i>God: the Author of Nature and the Supernatural</i>	1942
	P. J. Wiseman	<i>Creation Revealed in Six Days</i>	1948

Flood geology or creationism, subsumes science with a literal six-day creation reading of scripture.

Local creation The special act of creation by God was limited to a small area of the ancient near East.

Ideal time view. How old was Adam when God created him? He was apparently created with the appearance of age. The earth could likewise be created with the appearance of age, so this view purports.

Gap theory In order to reconcile the geologists', old earth view with the *prima facie* young earth view of Genesis a gap was inserted in Gen 1:2. God created in Genesis 1;1, this was followed by a catastrophe in Gen 1:2, and was followed by a re-creation in 1:3; 1:2 could provide the geologists with as much time as they required!

Age day This view holds that the days of creation were periods of time representing the development of the earth.

Pictorial day The days of creation in Genesis 1 are the days of revelation by God to 'Moses' of the successive acts of creation.

Abstract

The various understandings of the relationship between science and religion can be grouped into six categories: science replaces religion; religion replaces science; science shapes religion; religion shapes science; science and religion are independent; science and religion are in dialogue. The article illustrates and evaluates each of these theories of the relationship between science and religion. It is concluded that each of the categories discussed collapses into a 'religion shapes science' position, since religious convictions of some sort are basic to humanity. Ultimate (religious) beliefs are integral to science and maths, and so religious beliefs shape science.